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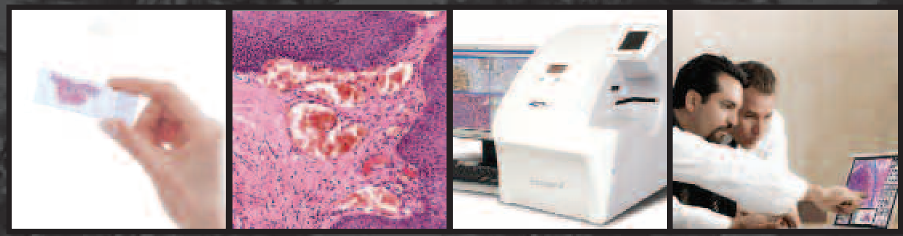
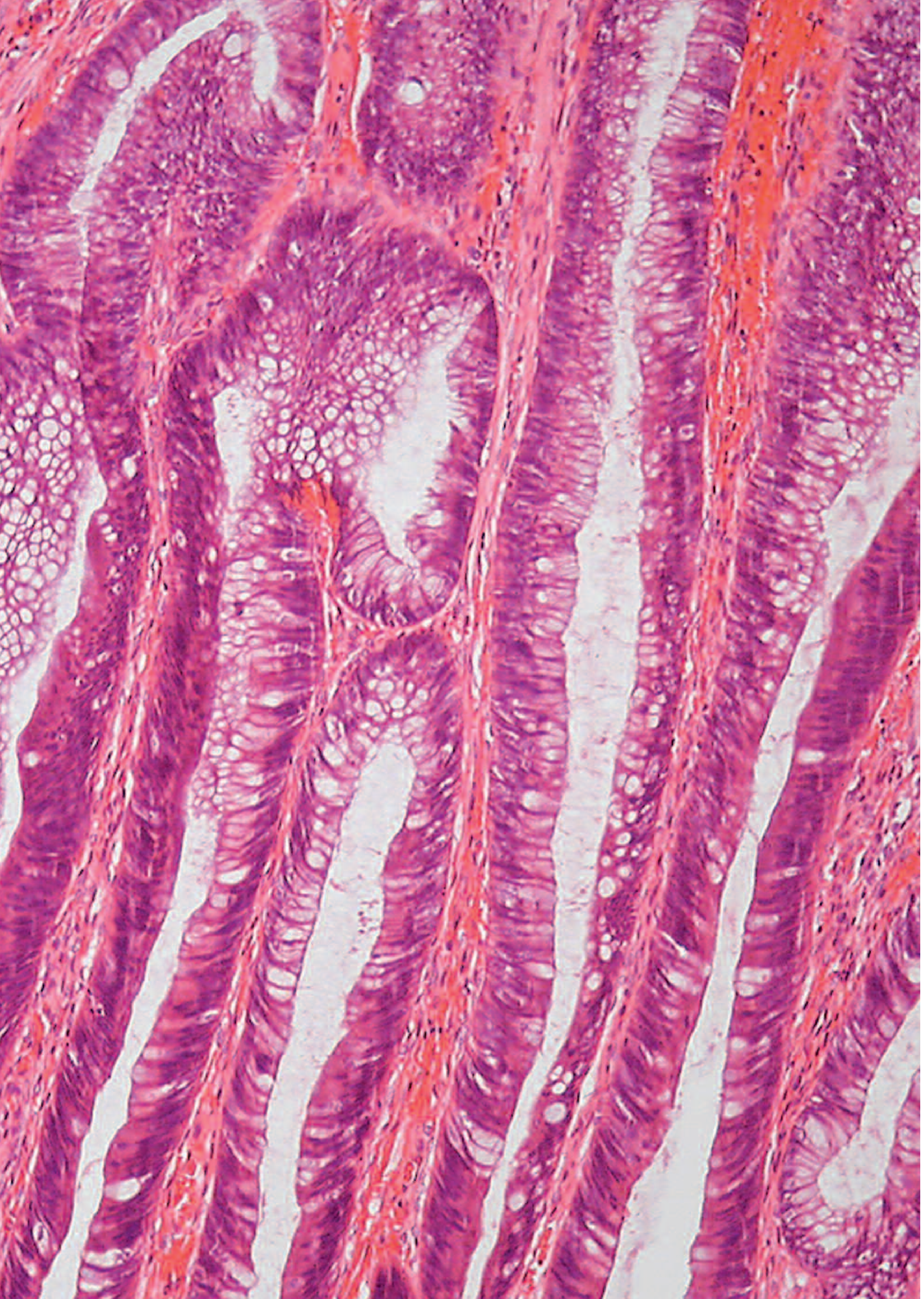


Telepathology working for you



Telepathology – working for you

With digital imaging at its heart, telepathology has finally come of age and is fulfilling its promise of revolutionising pathology practice and workflow. With the ability to share diagnostic quality images with one or multiple users across multiple sites – pathologists can provide remote expertise, consult easily with colleagues, conduct virtual MDT / MDM, streamline quality assurance procedures, and reach new and greater audiences for interactive teaching.

Whatever you want to achieve from telepathology, Nikon, in conjunction with its selected telepathology partners, has a solution. With a comprehensive portfolio of telepathology technologies and systems, Nikon is able to design a complete telepathology solution matched to your needs – from the capture, storage and exchange of macro images through to high capacity scanners for the creation of digital slides, image analysis and remote, dynamic telepathology. Easily imported file formats, networking software and LIMS-friendly systems, in addition, make it easy to integrate telepathology into existing IT networks.

In this brochure, you will find some insights into the breadth of telepathology technology now available and hear from centres that have embraced telepathology to achieve an easier and more effective way of working. We try to dispel some telepathology 'myths' and highlight benefits across a range of applications.

If you want to find out more about telepathology, call Nikon today for helpful and realistic advice from people who really understand your pathology needs.

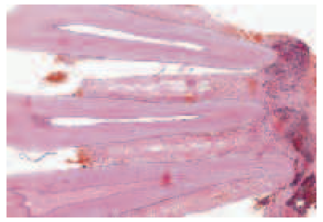
What is telepathology, why is it important?

Telepathology exploits digital imaging in conjunction with telecommunications systems to enhance and streamline pathology workflow. At its simplest, the digital image format allows users to capture, store, and export or import images across other computer software applications and email, internet or intranet applications. The addition of image management and image analysis software allows images to be more easily organised, annotated and, where required, analysed quantitatively (lesions counted, measured or compared).

The entire history of a specimen can be captured digitally – from images of lesions *in situ* and excised gross tissue, to tissue sections – enabling remote observers to gain a complete understanding of case features.

Digital or ‘virtual slides’, in addition, capture all the information normally contained on a traditional glass slide from the slide label and unmagnified ‘overview’ image to all fields-of-view at low and high powers. Some systems even allow remote observers to take control of the field-of-view, magnification, brightness and focus to reproduce the functions of a conventional microscope and enable independent remote viewing.

The power of telepathology cannot be underestimated in giving pathologist greater control and freedom in their everyday work. Benefits are illustrated in three principal application areas; consultation and remote diagnosis, education and quality assurance.



Key applications

Consultation and remote diagnosis

Telepathology allows images to be shared easily with one or more colleagues – in the next room, another hospital or in another country. This is invaluable in situations where a second opinion is urgently required, specific expertise is lacking, or when there is no onsite pathologist. Remote diagnosis avoids the need to transport slides and negates the requirement for pathologists to travel or maintain a physical presence, e.g. during out-of-hours surgery, and in isolated places.

Telepathology also offers a more efficient way of conducting MDT / MDM. In association with teleconferencing, participants can view and discuss case data without having to physically attend a meeting. Pathologist’s valuable time is used far more effectively, as well as reducing costs.

An additional advantage of digital diagnosis is that areas of diagnostic significance can be easily annotated to create an audit trail of diagnostic decision-making.

MYTH

Digital image resolution is not adequate for diagnostic pathology.

REALITY

The quality of high resolution imaging rivals that of film – enabling reliable diagnostic quality imaging. Digital imaging in addition offers advantages over and beyond film photomicrography, such as overview navigation aid, image analysis, annotation and easy import / export into other applications.

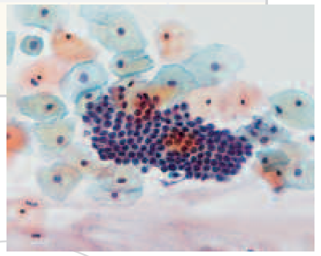
CASE STUDY LYMPHOMA

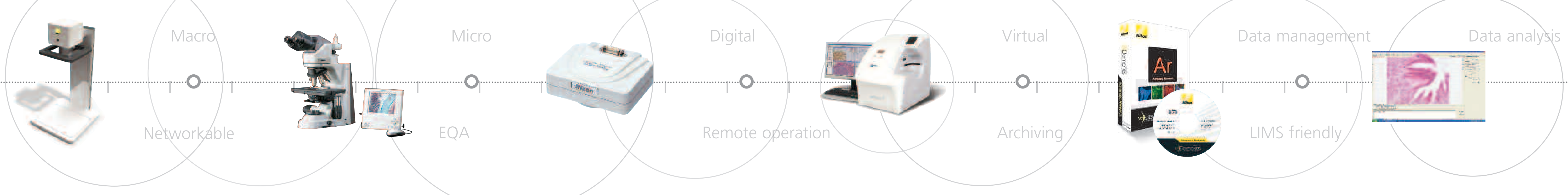
Telepathology transforms All Wales Lymphoma Panel case reviews

“In our set up, high-resolution digital images are shared with remote users via the Internet,” explains Dr Stefan Dojcinov, Consultant Histopathologist at the University Hospital of Wales. “The recipient requires only a computer with a high quality screen. Live images, virtually indistinguishable from those seen through the microscope, are transferred with a delay of less than a second.”

“Confidentiality is not an issue. Only anonymous images are transmitted with patient-sensitive information communicated via telephone. Any invited participant can have access from anywhere in the world using a password and browser interface. Static images as well as live sessions can be viewed.”

“We have two-way communication between Cardiff and Llandough and between Cardiff and the Morriston Hospital in Swansea,” Dr Dojcinov continues. “A link will also be established with Ysbyty Gwynedd in Bangor, North Wales. We also have a successful link between Cardiff and Belgrade. Distance is not a problem; I am amazed at how well it works.”





Education and EQA applications

Education

Ideal for education, the digital image format allows multiple students to access the same slide at the same time (via a projected image on a screen, networked computers, or downloaded from a website). Instructors can guide students through the diagnostic process secure in the knowledge that all students have access to the same information. Easily available images also mean that students can access information any time – enabling independent study.

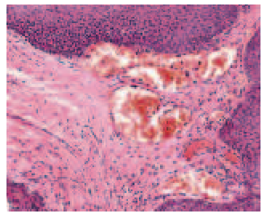
Any glass slide of educational interest can be 'digitised' to create an easily accessible (central) bank of valuable teaching material – with no risk of breakage or deterioration. Image archiving software, in addition, can be used to help organise data and make it easily accessible to multiple users.

MYTH

Digital image software and IT networks are unreliable / fragile

REALITY

This may have been a problem in the early days of telepathology. Today internet/ intranet/ broadband / web technologies are an integral part of everyday life and are far more robust and reliable.



EQA

Digital image formats provide opportunities for the creation of an easily accessible and consistent bank of high quality material suitable for EQA purposes – and a fairer system for participants.

Avoiding the need to circulate glass slides (with inevitable damage and loss) pathologists can take part in EQAs by accessing test material via their PC, when it is convenient to them. Online tests enable rapid delivery of results and greater security and confidentiality.

MYTH

Telepathology systems are complex and expensive.

REALITY

Today's systems are easy to use and very cost effective. The simplest system requires only a digital camera and access to a network

Which telepathology system?

There are many types of telepathology systems. These can be broadly described as either live (dynamic) or recorded (static) with local control (passive) or remote control (active).

Store and forward telepathology ('Passive Static' telepathology)

Involving the transmission of a recorded (static) image, this is the simplest and most accessible form of telepathology. It is almost universally used in everyday life to share images with other parties and to export images to other software applications for reports, presentations etc.

Although simple, it has wide application in pathology, for example in cytology, haematology, bacteriology and parasitology. The sender selects an area on the specimen slide of diagnostic significance for capture with a digital camera and transmission, most conveniently by email, to one or more recipients.

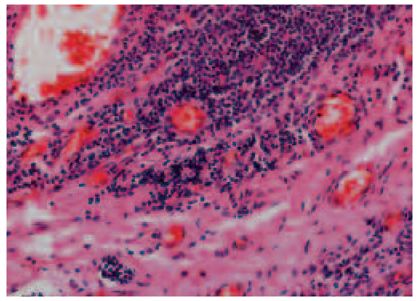
Store and forward telepathology is also useful for low magnification histology and immunohistochemistry, but is limited for detailed, high power histology. The recipient has no control over what is seen and relies wholly on the sender to select the most appropriate area of the slide. The recipient can zoom in but can see only the captured information.

This type of telepathology is, however, very convenient, fast, simple and inexpensive. It uses a consumer camera, dedicated microscope camera, or scanner to capture images, which can then be saved in convenient formats (JPEG, TIFF etc) for storage and transmission.

Locally controlled live telepathology

Locally controlled, live telepathology
(‘Dynamic Passive’ telepathology)

Particularly useful for convergent diagnosis, consultation, interactive teaching and MDT / MDM, this form of telepathology uses a high technology web cam specifically designed for microscopes. The system transmits ‘live’ microscope images via the Inter- or intranet with the sender in control of what is sent, when, and to whom, using password security. It is usually used in association with telephone or teleconferencing facilities and can be considered an extended discussion arm to the microscope. The recipient relies on the sender for microscope control (field-of-view, magnification, focus etc) although instructions for changes can be given over the telephone.



Cost effective, robust and reliable, this system is easy to set up and run although some IT expertise is required at both ends for installation. The recipient of live images has the ability to capture or download areas of interest for their own records.

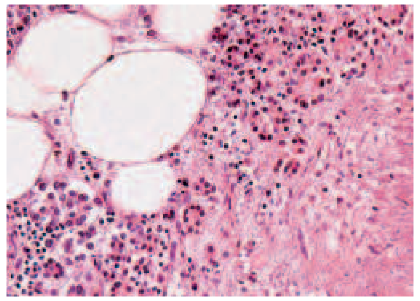
CASE STUDY **PATHALBA PROJECT**

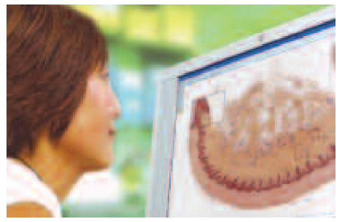
Through its ‘Pathalba’ project, Scotland has supplied its consultant pathologists with over 80 advanced digital imaging systems across the country.

With other ‘E Health’ initiatives, these will supply a complete suite of pathology information, including digital images, to the patient’s multi-disciplinary healthcare team, even if they are based on different sites thereby improving the quality of care. The first phase of the project involved attaching DS-Fi1 digital cameras to existing microscopes across 17 NHS Pathology departments.

`“These camera systems represent a vast improvement over previous technology in the compilation of microphotographs for multi-disciplinary team meetings and case discussions”, said Dr Jon Coldewey, Clinical Lead for Pathology in Lanarkshire. “The technology will allow pathologists to discuss difficult frozen section cases live with colleagues located many miles away. In the future, with an even more central image database / server, referred cases can be discussed between the local pathologist and tertiary centres with ease.”

The new network will not only provide a platform for image sharing and consultation but will also initiate national standardisation of image storing and retrieval with images searchable by a number of parameters, including disease code.





Remotely controlled recorded telepathology

Remotely controlled recorded image telepathology
(‘Active Static’ telepathology)

This type of telepathology relies on the digital or ‘virtual’ slide, where all the visual information normally available from a conventional glass slide (all fields of view at all magnifications) is digitally captured by a scanner and stored and accessed via a web server. This system generates very large data files, but has no impact on individual user’s PC systems because the files are stored on a remote server, with users accessing only the information that they need (similar to websites such as Google Earth (http://earth.google.com) .

The system offers benefits over and above conventional glass slide microscopy. For example, diagnostic quality images are accompanied by a low power overview enabling the user to map the area being examined. Magnification is altered at the click of a mouse and regions of interest can be recorded using a capture function. Areas on the slide that have been examined can be logged into the file history. The slide label can be viewed so there is no increased risk of reviewing the wrong case. Differently stained sections can also be viewed side-by-side, a very useful function that is impossible with conventional microscopy. All images, including those from cut-up, can be viewed remotely to provide entire case information.

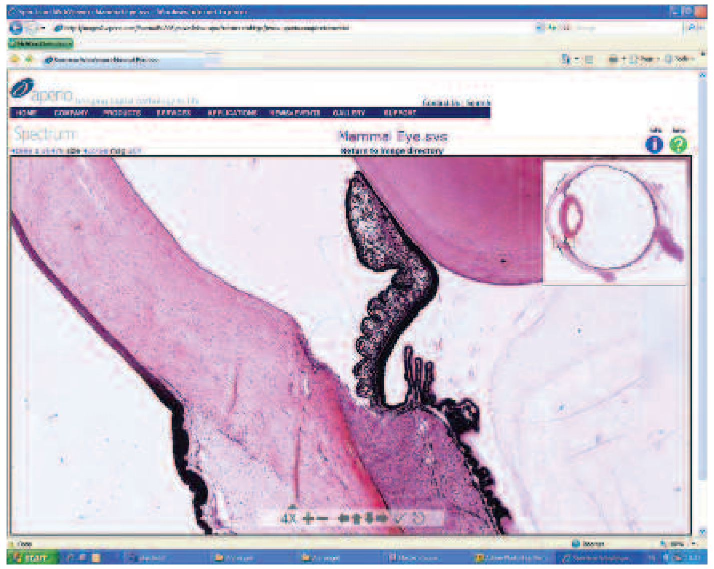
Digital slides are ideal for consultation, education and EQA. High throughput scanners are now available for digitising large number of slides – to create a completely digital image bank or archive.

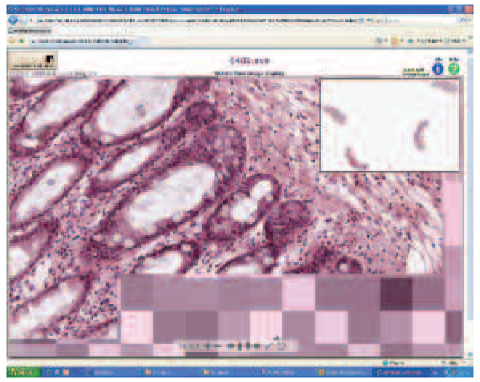
MYTH

Virtual / digital slides are too large to download

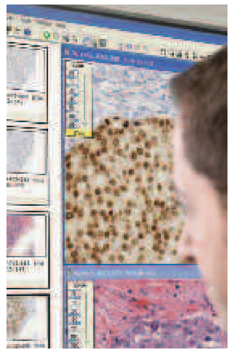
REALITY

That is true, but digital slides are stored on a server – download only what you need, when you need it. Extremely fast acquisition rates allow virtually seamless observations with no impact on your hard drive.





Typical screen shot of Slide scan being processed



Live remote controlled telepathology

Live imaging with remote control ('Dynamic Active' Telepathology)

Here the recipient is able to take live control of slide observations by remotely controlling microscope functions (field-of-view, magnifications) and enabling independent viewing. This telepathology solution is ideal for consultation and remote diagnosis, especially in situations such as operating theatres or annexes with no specialist cover. Simply load the slide and the remote user takes over.

Operation is simple with scanned images viewed over a network, although installation requires some IT expertise at both ends. All information (slide label, overview image, all fields of view and all magnifications) is available to the remote observer. An ideal solution for rapid, remote diagnosis, live telepathology with remote control is far more convenient and cost effective that delivering a slide to a remote pathologist.

MYTH

Telepathology is an insecure method of transferring sample data

REALITY

Telepathology transmits only what you want to send, when you want to send it. In most cases only anonymous images are transmitted with patient-sensitive material discussed over the 'phone.

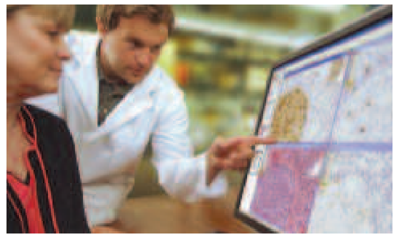
CASE STUDY MERCY SHIP

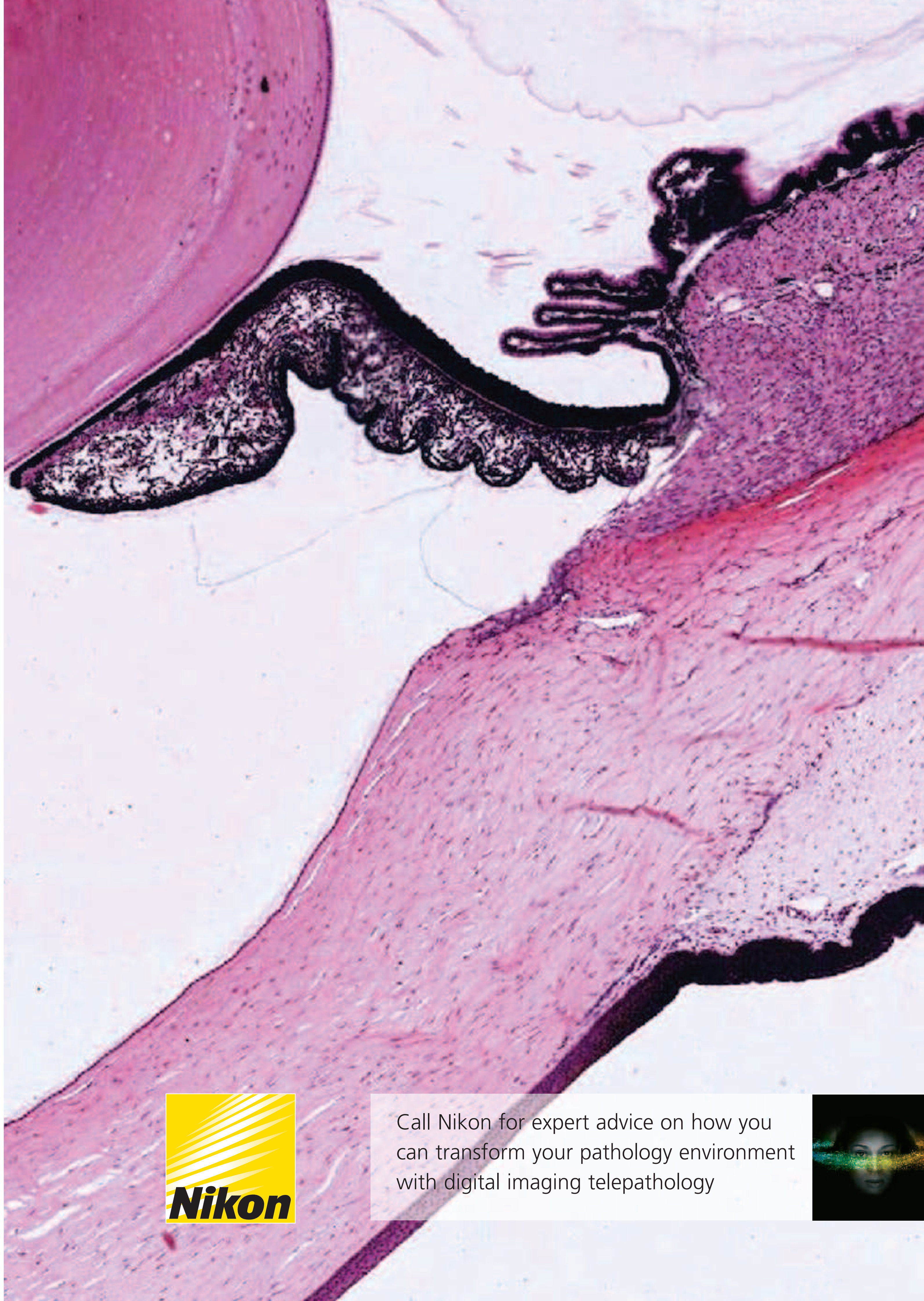
Remote diagnosis for the Mercy Ship Africa

Bringing world-class, free-of-charge medical assistance, relief aid, training and education to developing nations, the Africa Mercy and Anastasis now have access to full time pathology expertise via Nikon's Coolscope telepathology solution.

"For the first time expert consultations can be made remotely, providing access to the expertise of a full-time pathologist for immediate and accurate diagnosis, something that would previously have taken weeks," comments Professor Lord Ian McColl, Vice Chairman of the Mercy Ships charity and Professor of Surgery at Guy's Hospital, London.

Easy-to-use technology means that staff on the Anastasis can capture excellent images after minimal training. All that is required, besides the all-in-one eyepiece-less microscope, is a monitor and mouse. Once the slide is loaded there is no need for optical alignment, as the Coolscope automatically adjusts illumination intensity, contrast and focus. With the image displayed on the monitor, remote users need only to move its mouse to navigate through the specimen, making geography and distance irrelevant.





Call Nikon for expert advice on how you can transform your pathology environment with digital imaging telepathology